



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
KARL GUENTHER, et al

Serial No. **10/685,300**

Filing Date: **October 14, 2003**

For: **OVERHEAD SUSPENDED
TRANSPORTATION SYSTEM AND
METHOD**

Examiner: **Robert J. McCarry Jr.**

Group Art Unit: **3617**

Attorney Docket No. **32022**

Commissioner for Patents
Alexandria, VA

Sir:

DECLARATION OF WILFRED SERGEANT
UNDER 37 CFR § 1.132

I, Wilfred Sergeant, do hereby declare and say as follows:

1. I am a named inventor of the transportation system and method that is the subject of the above referenced patent application. I am a citizen of the United States of Canada and a resident and employable in the United States under a Permanent Resident Card and a resident of Florida residing at 3626 Shady Bluffs Drive, Largo, Florida 34640.

2. I was born in Kingston-upon-Hull in the United Kingdom of Great Britain and Ireland on 4th December 1919. I attended The Hull Municipal Technical College and was graduated from the University of London with honors degrees of Science in Mechanical and Electrical Engineering. I qualified as member of both the Institution of Electrical Engineers and the Institution of Mechanical Engineers in the United Kingdom, and am a retired member of the Order of Engineers of Quebec. My early training was

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with the English Electric Company, manufacturers of railroad locomotives, electric and diesel-electric rail vehicles and maintainers of railroad. I transferred to the London Subway System in England, operators of an intensive streetcar and subway system, where I gained training and operating experience in train operations transporting more than a million commuters per day during each peak period. As a result, I have a thorough understanding of the influence that different service requirements have upon the combinations of vehicle weights, required accelerations and braking rates, maximum speeds, engine power installed on board the vehicles or line power demands in electrified systems, strength and power-handling capacity of vehicle drive systems, and adhesive factors of wheel/rail interfaces. I was employed as a Professional Engineer and later as a Management Consultant with the Canadian National Railways, for 34 years, until the age of retirement. This involved assignments to the Operations Department in various locations as Transportation Engineer, supervising operations and maintenance of freight trains, passenger trains and commuter trains, and assignments to the Research Department managing development of new train equipment, routing of new rail lines and development of new rail service to clients. My career included managerial responsibility in the implementation of the rail commuter service called "GO-Transit" in Toronto. I have worked as Management Consultant in many different consulting assignments in Canada, Europe and South America, having an opportunity to learn from these experiences about conditions on railroads in other countries. I have made studies and recommendations for railroads and transit lines in both Canada and South America. I became Vice-President, Planning and Operations for Sky Train Corporation in Florida endeavoring to develop and market the well-established technology of streetcars in a new arrangement as an overhead-suspended light rail system. My publications include: "Privatization of Buenos Aires Commuter Railways": Argentina, 1992; "The 1989 Revue": VIA-Rail Canada, 1989; "High Speed Trains for the

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Quebec-Windsor Corridor" VIA-Rail Canada, 1984; "What is a Station?": Transport Research Board, Washington, 1980; "Safety at Grade Crossings for Trains at Speeds up to 200km/h": TRB, Washington, 1977; and "Access to Mirabelle Airport": Government of Quebec, Canada, 1974.

3. I have reviewed the comments made by the Examiner and the patent references cited in the Office Action of 04/04/2005, including US Patent Nos. 3,861,315 to Rypinski; 5,381,737 to Ternary; 4,841,871 to Leibowitz; and 6,622,637 to Cummins. As a result, I feel the following technical support will be helpful for a better understanding of the claims invention.

4. Independent claims 1, 38, and 46, by way of example, call for rigidly attaching the car body to the suspension member. The carrying vehicle is traveling in an overhead duct and the car body beneath is rigidly attached to the suspension member for creating an axis of rotation of the above a center of the carrying vehicle. This feature is not disclosed in cited references nor suggested in the art.

5. By way of further explanation, a car body of any significant length will typically require that it be suspended at both ends to hold it level with the carrying vehicle. The points of support will be attached along the centerline of the carrying vehicle near the ends. Two problems arise if the supports would be loose, such as with the cables suggested by Rypinski '315, hanging beneath the ends of the carrying vehicle. One problem is that the car body could swing forward and back while remaining parallel with the carrying vehicle. Limited freedom of movement is provided by the claimed invention. The other problem is that one end may swing in one direction while the other swings the other way, so that the car body departs from the centerline somewhat resembling the movement of a fish swimming along in a manner known as "fishtailing". The claimed invention permits the car body to swing sideways when in

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motion on curves, but with both ends swinging in the same direction to keep the car body in line with the centerline of the carrying vehicle and thus avoids fishtailing. The car body is allowed to have a rolling motion, as it swings sideways while preventing any swinging forward and back and ensuring that the suspension members will remain in one plane to avoid any risk of fishtailing. The car body thus swings about an axis of rotation at or above a centerline of the chassis. In one form, rigid plates may be affixed on the roof of the car body in the for-and-aft direction. When the carrying vehicle enters a curve following along a track or line of roadway, the curving track or roadway displaces the chassis of the carrying vehicle sideways, while the inertia of the car body below would continue in a straight line. This applies a sideways force that pulls the car body sideways into the curve, while the strength of the posts tilts the body and the tilted floor compensates for the centrifugal forces of the curving motion. The vertical distance between the chassis of the carrying vehicle and the center of gravity of the car body creates a torque causing the tilting of the body and outward swing on the curve. This creates the action of a pendulum swinging about an axis of rotation at or above the centerline of the chassis.

6. Rigidly attaching the car body to the suspension member beneath a carrying vehicle isolates it from lateral impacts and suspension harmonics at the carrying vehicle, thereby affording a much smoother ride for passengers and freight. When comparing the claimed invention to traditional mounting of vehicles above their trucks, a car body attached below the carrying vehicle swings out on curves, allowing faster speeds while the contents inside the car feel no lateral forces. Passengers do not sense any lateral centrifugal forces, allowing speeds on curves faster than can be permitted in bottom-supported vehicles. The technique can be applied as required to intercity passenger service, to urban transit or to freight vehicles. This ability to go around curves faster reduces journey times, minimizes fleet requirements, improves

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comfort and provides a new image for mechanized transportation. At the same time, it achieves complete grade separation, overcomes the handicaps of laying rail tracks at grade, weeds and weed-killers, fences severing farms and communities, disruption of commerce and existing land uses, dangers at grade crossings, highway vehicles being hit by high speed trains, risks to children, trespassers and animals on the tracks, and the hazards of winter conditions, floods, snow removal and icing conditions. When brought to standstill on a curve, the car body simply swings back to the vertical position. The passengers feel no discomfort at standstill, so that passenger comfort does not limit the permissible tilting of the track or roadway above.

7. The permissible elevation of one rail higher than the other, known as superelevation of track, will be governed by the limit of friction between the wheels and the running surface, so that, at standstill, the wheels do not slide down towards the low side. The combination of a carrying vehicle in the duct with a car body carried beneath it is different from those limiting the achievable superelevation on curves in bottom-supported vehicles. The claimed invention allows one to apply a greater superelevation, provide comfort for passengers being carried within the car body, and provide relatively fast, yet safe speeds on curves, unlike any system known in the art.

8. Independent claims 11, 60, and 68 introduce the features of coned (tapered) and synchronized wheel pairs for achieving a self centering or self steering. With regard to the following description, reference is made to the attached diagrams A, B, C, D. The technology of the steel wheel/steel rail has been under continuous development for many years, but the basic principles are now fully established and incorporated in most railroad and light rail installations. The application in an overhead system using a light rail technology of coned steel wheels/steel rails has not been used or published in any other patent application, and for the claimed invention provides a

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desirable result. A wheel is a disc of hard material designed to roll on a flat surface, attached to an axle that passes through a bearing housed in the wheel center. Under load, the wheel center presses down through the wheel to transmit the load down to the running surface. The portion of wheel that rolls on the surface is called the "tread". An individual wheel, rolling along a flat surface, has no sideways forces, so that it would continue to roll straight ahead in the direction it is pointing. To change the direction of rolling, the wheel must be turned by some other influence. In many cases, the tread is cylindrical, to distribute the load evenly when rolling on a flat surface. In the days when railroads were first invented, the rails were just flat plates laid at a fixed distance apart, known as the "gauge" to match the separation of the wheels of the vehicles, and the treads were cylindrical with every tendency to run off the railhead as they rolled along. The solution was to add flanges on the inner sides of the wheels. A flange is a part of the wheel of diameter slightly larger than the tread and located on the inner face so that if the wheel rolls towards the rail, the flange presses against the side of the rail and prevents the wheel from rolling off. In railroad applications, the tread is not cylindrical. The rolling diameter decreases slightly from the diameter at the inner edge of the wheel to the outer edge creating a taper on the wheel diameter. Thus the treads of the wheels take the form of a cone and have been referred to interchangeably as "tapered" or "coned" wheels. This is normally a taper of 1 in 20. In this text, the description "coned" will be used. The beneficial characteristic of coning is achieved when these wheels are hard pressed one on each end of a solid axle making it a "wheelset" so that the rotation of both wheels is identical or synchronized as they roll along. The wheels are pressed on with the smaller wheel diameter on the outer face tapering up along the cone shape towards the inner face, still with a flange at the inner side of the wheel and with the flanges slightly closer together than the gauge of the rails they will run on, leaving a small freedom between the rails and the flanges. The rails have a slightly rounded head

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to be compatible with coned wheelsets. The rounded head of the rail makes contact with the wheels along a narrow portion of the tread, normally so that, when the wheelset is central on the track, both wheels are rolling on identical wheel diameters and therefore continuing in a straight line along the track as shown in "Figure A - function of tapered (coned) wheels". If for any reason the wheelset diverges on to a diameter of one wheel larger than the other with the two wheels rotating at the same rate, the larger wheel rolls slightly more forward of the other thereby steering the wheelset back inwards towards the centerline of the track to correct the divergence. Self-steering is achieved in this way as shown in "Figure B - Function of tapered (coned) wheels: wheels on a curve". When the coning of the wheels is adequate to follow along a curve in the track, the flanges do not come into contact with the rails. Figure C shows the action at the railhead in a train at speed on such a curve. The weight of the vehicle passes vertically downwards, while the lateral friction between wheel and rail resists the sideways centrifugal forces, so that the net reaction is a loading downwards into the rail at a slight angle from the vertical. For this reason, railroads frequently lay their rails leaning inwards at an angle of 1:20 to better resist these lateral loadings. If the curve of the track would be too sharp for the coning to accommodate, then the flanges come into contact with the side of the outer rail, in a condition known as "flanging" as shown in "Figure D - Steel wheel on sharp curve: outer rail". The tread of the wheel rolls towards the outer rail and would climb up over the railhead, except that the flange pressing against the side of the rail prevents it from rolling further in that direction. This pressure forces the wheel to slide sideways on top of the rail to the extent that the natural steering fails to accommodate. This sideways sliding has been the cause of some of the squealing wheels heard in earlier days of railroad operations. Sharp curves are avoided in main lines and usually are restricted to switching yards and industrial sidings.

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9. I hereby declare that all statements made herein of my own accord are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 5, 2005
Date

W. Sergeant

Wilfred Sergeant